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ROTARY 1'1 EZOELECTRIC MOTORS ACTUATED BY TRAVELING WAVES

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ABSTRACT

Piezoelectric rotary motors arc being developed as a drive mechanism for miniature spacecraft instruments and subsystems. The technology that has recently emerged in commercial products requires a more rigorous analytical tools for effective design. An analytical mode] was developed to examine the excitation of plate wave traveling in a rotary piezoelectric actuator. Tbc model uses annular finite elements that are applied to predict the excitation frequency and modal response of the annular stator. This model allows to design efficient piezoelectric motors and it incorporates the details of the stators which include the teeth, piezoelectric crystals, stator geometry, etc. The theoretical predictions and the experimental corroboration showed a remarkable agreement and they wi 11 bc presented and discussed in this paper.

Key Words: Actuators, Piezoelectric Motors, Active Materials, Ultrasonic Motors, Stators and Rotors, Modal Analysis

Principal Author Biography

Dr. Shyh-Shiuh Lih is a mechanical engineer and a Member of the Technical Staff at the Technical Staff at the Science and Technology Development Section, JPL. He joined the Integrated Material Systems and Components Group at JPL in 1995.1 le is active in research and development of piezoelectric actuators and nondestructive evaluations (NDE) techniques for space applications, Dr. 1 .ih has been a Research Engineer at the

Mechanical, Aerospace and Nuclear Engineering Department, UCLA from 1992-1994. His technical expertise are dynamic response of piezoelectric actuators, composite materials and structures, NDE of materials, adhesive joints and thin films, mechanics of advanced materials, finite element analysis, and modeling and analysis of aerospace structures and components. Dr. Lih has been a consultant at JPL from 1993 to 1995, where he developed and performed a series of ultrasonic experiments to characterize the elastic properties of composite materials, adhesive joints, and damping of materials and demonstrated that the calculated wave forms based on the suggested models are in remarkable agreement with laboratory data.